DESCRIPTION

GENERAL

The Model 360S2 Median Selector Module selects the middle magnitude of three input signals and provides a proportional output current. With the use of two external voltage sources, it can function as a Hi/Lo signal limiter.

The Median Selector Module is designed to be plugged into a Model Series 380 Card Cage Enclosure equipped with a common power supply (see Service Instruction SD3801).

CIRCUIT

Typically, the device accepts three 1 to 5V dc signals, selects the one that is of middle magnitude, and converts it to a proportional 4 to 20 mA or 10 to 50 mA output current. Refer to the SPECIFICATIONS section for the exact adjustment parameters and operating limitations.

A block diagram of the Median Selector Module is shown in Figure 1. The three input signals are grouped into three pairs constituting the maximum possible combinations. Each pair of signals is fed to a high signal selector. The outputs from the three high signal selectors exhibit only the two highest signals: two outputs, each with identical signals, being the highest and the third output being the next highest signal. The lowest input signal is rejected.

Next, the outputs from the high signal selectors are fed to a low signal selector where two signals of the highest magnitude are inhibited while the next highest signal is passed on to the output amplifier. Thus, the median signal selection is accomplished by first inhibiting the lowest and then the highest input signal.

The output amplifier converts the typical 1 to 5V dc median signal to a proportional 4 to 20 mA current signal. The range jumper, located on the solder side of the P.C. board, can be set to provide a 10 to 50 mA current signal. Zero and span controls are provided for precise output signal adjustments. Refer to the CALIBRATION section for the exact procedure.

In application as a Hi/Lo limiter, the Median Selector Module must be provided with two voltage references. These voltage references can be simple 50K ohms potentiometers connected across a steady low voltage source. One voltage reference is set to the required Lo limit level and applied to one input. The other voltage reference is set to the required Hi limit level and applied to a second input. The signal to be limited is led to the third input. As long as the input signal remains between the Lo and the Hi reference voltages, it will be selected as the median signal and will appear at the output. However, as the input signal moves above the Hi reference, it becomes the highest signal. This makes the Hi reference a median signal and is therefore selected to appear at the output; the higher input signal is rejected. The Lo limit function operates in a similar manner.

FIGURE 1 Block Diagram

MOORE PRODUCTS CO., Spring House, Pa. 19477
SPECIFICATIONS

INPUT

Range .......... 1 to 5V dc
Overload ........... ± 30 Volts (Maximum)
Impedance ........ 5 Megohms (minimum)

OUTPUT

<table>
<thead>
<tr>
<th>Field Selectable RANGE</th>
<th>Permissible Load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AC Powered Enclosures</td>
</tr>
<tr>
<td>4 to 20 mA</td>
<td>0 to 900 Ohms</td>
</tr>
<tr>
<td>10 to 50 mA</td>
<td>0 to 360 Ohms</td>
</tr>
</tbody>
</table>

Load Effect .......... Less than 0.1% within permissible load range.
Current Limiting ...... Output will not exceed 150% of full scale when input is overdriven.
Response Time .......... 150 mSec. to reach 98% of span (typ.)
SPAN ADJUSTMENT ...... ± 5% of output span
ZERO ADJUSTMENT ...... ± 5% of output span
ACCURACY .............. ± 0.15% (max.)
AMBIENT TEMP ........ 32 to 122°F (0 to 50°C)
ISOLATION ............... The negative input and output terminals are common to each other and to the power supply common bus.

RANGE SELECTION

Before proceeding with the installation and calibration, determine which output range is required in your application. Jumper J1, located on the solder side of the circuit board, determines the output range.

<table>
<thead>
<tr>
<th>Output Range</th>
<th>Range Jumper</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 to 20 mA</td>
<td>J1 Removed</td>
</tr>
<tr>
<td>10 to 50 mA</td>
<td>J1 Intact</td>
</tr>
</tbody>
</table>

INSTALLATION

The Median Selector Module must be installed in a Model Series 380 Card Cage Enclosure. It can be plugged into any of the slots in the enclosure. Refer to customer drawings for the designated slot or assign a convenient slot for it.

WARNING

Remove all power on signal and power supply wires before making any connections or setting the safety keys in the card cage enclosure.

The safety keys in the card cage enclosure must be set before the module is plugged in. Service Instruction SD3801 identifies these safety keys and gives the procedure for setting them. The positions of the keys for the Median Selector Module are as follows:

Left Key: V Vertical
Right Key: V Vertical

The input and output connections are made to the terminal strips provided at the front or the rear (depending on model) of the card cage enclosure. Each terminal strip is identified with a number that matches a corresponding slot number. Refer to the Connection Diagram (Figure 2) in this Instruction and to Service Instruction SD3801.

NOTE

All the plug-in modules in the card cage share the same SIGNAL COMMON bus line due to their common power supply. Be careful when connecting various signal lines to avoid possible ground loops or shorts.

To convert a current signal to a voltage signal, select an appropriate conditioning resistor listed below, and connect it across the required input or output terminals.

<table>
<thead>
<tr>
<th>Current Signal</th>
<th>Conditioning Resistor (to obtain 1 to 5 Volts)</th>
<th>MPCo. Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 5 mA</td>
<td>1000 Ohms ± 0.1%</td>
<td>15037-228</td>
</tr>
<tr>
<td>4 to 20 mA</td>
<td>250 Ohms ± 0.1%</td>
<td>15037-229</td>
</tr>
<tr>
<td>10 to 50 mA</td>
<td>100 Ohms ± 0.1%</td>
<td>15037-230</td>
</tr>
</tbody>
</table>

When connecting several conditioning resistors in series in a current loop, make sure the total loop resistance does not exceed the permissible load resistance of the source. Also, watch out for inadvertently connecting several resistors in parallel.

TERMINALS ON CARD CAGE ENCLOSE

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>INPUT A</td>
</tr>
<tr>
<td>2</td>
<td>INPUT B</td>
</tr>
<tr>
<td>3</td>
<td>COMMON</td>
</tr>
<tr>
<td>4</td>
<td>OUTPUT CURRENT</td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>NC</td>
</tr>
<tr>
<td>7</td>
<td>INPUT C</td>
</tr>
<tr>
<td>8</td>
<td>COMMON</td>
</tr>
<tr>
<td>9</td>
<td>OUTPUT VOLTAGE</td>
</tr>
</tbody>
</table>

NOTES:
1. STANDARD INPUTS ARE 1 TO 5 VDC. FOR CURRENT SIGNALS USE PROPER INPUT CONDITIONING RESISTORS.
2. ALL NEGATIVE INPUT AND OUTPUT TERMINALS ARE COMMON WITH THE DC POWER SUPPLY IN THE RACK ENCLOSURE.
3. REFER TO SPECIFICATIONS SECTION FOR OUTPUT LOAD LIMITS.
4. THE SELECTED SIGNAL OUTPUT VOLTAGE (BETWEEN TERMINAL 9 AND 8) CANNOT BE LOADED WITH RESISTANCES BELOW 1 MEGOHM.

FIGURE 2 Connection Diagram
CALIBRATION

The Median Selector Module is normally shipped calibrated for the required range. When performing periodic calibration checks or a complete calibration, the following procedure is recommended. Figure 3 shows the location of the span and zero trimpots.

1. Check the range jumper to be sure the correct output range has been selected. (For details refer to the Range Selection Section.)

2. Plug the module into the card cage.

3. Obtain an adjustable input signal source. It can be any of the following or similar devices:
   a) Voltage Source — typically 0 to 5V dc
   b) Current Source — typically 0 to 20 mA
   c) Transmitter — adjustable over required range

   These devices must be adjustable to an accuracy of 0.1% or better.

4. Connect the signal source to all three input terminals of the module (terminals 1, 2 & 7 with 3 & 8 serving as signal return). If the signal source is a current, use one appropriate conditioning resistor across the common input terminals; do not use additional conditioning resistors in parallel.

5. Obtain an output measuring device such as a digital multimeter. It must be capable of measuring the required current or voltage to an accuracy of 0.1% or better.

6. Connect the output measuring device to output terminals 4 and 5 on the card cage enclosure. Refer to the SPECIFICATIONS section for output load restrictions. Use an appropriate conditioning resistor across the output terminals if a voltage measuring device is utilized.

7. Set the signal source to the minimum range setting (typically +1.0 Volts). Adjust the ZERO trimpot to read the minimum range setting on the output measuring device (typically 4.0 mA).

8. Set the signal source to the maximum range setting (typically +5.0 Volts). Adjust the SPAN trimpot to read the maximum range setting on the output measuring device (typically 20.0 mA).

9. Repeat steps 7 and 8 several times until the ZERO and SPAN readings are as required.

This completes the calibration procedure.

MAINTENANCE

CLEANING

The module should be cleaned as often as operating conditions require. The accumulation of dust and dirt on components prevents efficient heat dissipation which can cause overheating and component breakdown.

Blow off accumulated dust and dirt with dry, low velocity air. Any dust or dirt that remains should be removed with a soft brush or cloth dampened with a mild detergent and water solution. Cotton-tipped swabs are useful for cleaning in narrow spaces.

CAUTION

Avoid the use of chemical agents which may damage plastic components or protective coatings.

VISUAL INSPECTION

The module should be inspected occasionally for defects such as loose or broken connections, damaged circuit board, and heat-damaged components.

The corrective action for most visible defects is obvious. However, if a heat-damaged component is found, the cause of overheating must be corrected to prevent a recurrence of the damage.

CAUTION

Exceeding the specified ambient temperature limits can adversely affect performance and may cause damage.

TROUBLESHOOTING

If the module does not operate properly when initially installed, check the terminal strip wiring. Most problems in new installations can be traced to wiring mistakes. Also, verify that the equipment associated with the input and output circuits is functioning and is properly calibrated.

If the trouble is traced to the module, remove the module and give it a full bench check. A complete schematic of the module is given in Figure 4.

A Part No. 15378-27 Card Extender can be ordered. It extends the module beyond the front edge of the card cage enclosure, providing easy access to both sides of the module's circuit board.

IMPORTANT

Warranty repair and replacement requires the module to be returned to Moore Products Co., Spring House, Pa. 19477. The warranty is null and void if repair is attempted at any other location.

RECOMMENDED SPARES

There are no recommended spare parts for the Median Selector Module.

One spare module is recommended for every 1 to 10 in service.